## The many roads to Rome: induction of neural precursor cells from fibroblasts.

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**Authors:** Ernesto Lujan, Marius Wernig

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**Public Summary:**
Efficiently obtaining tissue specific cells from patients is an important objective for cell replacement therapy and disease modeling. For certain cell types such as neural tissue in the brain this is particularly challenging and invasive. Recently our lab and several other labs have successfully converted mouse skin cells directly into neural stem-like cells which can divide indefinitely and can differentiate into the cell types that make up the brain -- neurons, astrocytes, and oligodendrocytes. Additionally, these neural stem-like cells have been injected and can engraft in the mouse brain. Here, we review the different approaches that each of these labs have taken and the combination of factors used to induce this conversion.

**Scientific Abstract:**
The experimental induction of specific cell fates in related or unrelated lineages has fascinated developmental biologists for decades. The evaluation of altered cell fates in response to ectopic expression during embryonic development has been a standard assay for interrogating gene function. However, until recently examples of cell lineage conversions were limited to closely related and primitive cell types. The induction of pluripotency in fibroblasts prominently highlighted that combinations of transcription factors can be extremely powerful and are much more effective than single genes. On the basis of this conclusion we previously identified transcription factor combinations that directly induce functional neuronal cells from mesodermal and endodermal cells. This work has evoked numerous additional studies demonstrating direct lineage conversion into neural and other lineages. Here, we review the generation of neural progenitor cells from fibroblasts, which is the newest addition to the arena of induced cell types. Surprisingly, two fundamentally different approaches have been taken to induce this cell type, one direct approach and another that involves the intermediate generation of a partially reprogrammed pluripotent state.